TITLE OF THE INVENTION

[0001] A feeding pump device of volume tube continually metering type

BACKGROUD OF THE INVENION

[0002] This invention is involved with a device of feeding pump device of metering type, especially involved with a device of metering type feeding pump that can be used to measure the definite-quantity output and the flow of the liquid media, to demarcate the container volume and to calibrate the measurement instruments and devices of the liquid medium flow.

[0003] The volume tube device known has no option but to conduct the metrology for part of medium passing through the volume tube device, whereas cannot conduct the definite-quantity output and metrology for all medium passing through the volume tube device.

A known feeding pump metrology device such as a volume tube flow meter disclosed in Chinese Patent 90200439.5 has no option but to conduct the definite-quantity output for the medium whose flow is relatively small, and the minimum measuring unit normally is a fixed volume, and the size of the minimum unit determines the measurement deviation; such device conducting the measurement by means of measuring the volume delivery number cannot carry out the definite-quantity output and measurement for the medium whose flow is relatively mass.

BRIEF SUMMARY OF THE INVENTION

[0004] In order to overcome the shortage that the known volume tube device cannot carry out the definite-quantity output and measurement for all medium passing through the volume tube device and the shortage that the known volume tube device is deficient in conducting the definite-quantity output and measurement for the medium whose flow is relatively mass, the purpose of this invention is to provide such a design plan of volume tube delivery measurement device: its measurement method is on a basis of measuring the piston displacement, its calculation basis is using reciprocating piston number and piston displacement quantity, and its measurement unit is a product of the minimum resolution unit of the grating ruler and the cross section area of volume tube measurement volume, so as to combine and develop the functions of the traditional volume tube device and the medium measurement feeding pump.

[0005] The purpose of this invention can be reached through using the following technical measures: design and manufacture a continuous feeding pump device of volume tube, including volume tube and its dragging mechanism; a measurement volume zone, unilateral liquid inlet valves, and unilateral liquid outlet valves are set in the mentioned volume tube; in especial, the mentioned volume tube has each two of unilateral liquid inlet valves and unilateral liquid outlet valves, respectively set at two ends of the inner walls of the mentioned volume tube; a piston is also set in the mentioned volume tube, and the piston is used to connect the mentioned dragging mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Figure 1 is a structure diagram of continuous feeding pump device of volume tube of this invention.

[0007] Figure 2 is a structure diagram of the mentioned continuous feeding pump device of volume tube using linear motor.

[0008] Figure 3 is a timing sequence diagram of lead screw rotation speed and valve lifts of the mentioned continuous feeding pump device.

DETAILED DESCRIPTION OF THE INVENTION

[0009] Combined with the attached drawings, the preferred embodiments of this invention are described in detail as follows:

[0010] A continuous feeding pump device of volume tube includes volume tube 1 and dragging mechanism 2, where measurement volume zone 11, unilateral liquid inlet valve 8 and unilateral liquid outlet valve 7 are set in the mentioned volume tube 1; in especial, the mentioned volume tube 1 has two unilateral liquid inlet valves and two unilateral liquid outlet valves, respectively set in two ends of inner walls of the mentioned volume tube 1; a piston 9 is also set in the mentioned volume tube; the piston 9 is connected with the mentioned dragging mechanism 2.

[0011] A grating ruler 4 located on the moving route of dragging rod of the mentioned piston 9 is also set in the mentioned continuous feeding pump device of volume tube.

[0012] The mentioned dragging mechanism 2 can be a servo motor device including servo motor 22, belt gear 21, lead screw 23 and lead screw nut 25, which are connected in turn; and it can also be a linear motor.

[0013] For the one using servo motor device, casing pipe 6 of lead screw is connected with the mentioned piston 9 at the outside of the mentioned lead screw 23. The lead screw can be rotated in the casing pipe of lead screw connected with the piston.

[0014] There are two kinds of concrete methods. One, using the ball screw turns the rotation movement of the motor into the rectilinear movement of the piston; passing each respective inlet and outlet unilateral valve, the measurement volume at two sides of the piston is quantitatively outputted and measured one time in a moving period of the piston. Another, using the linear motor to drive the piston conducting the rectilinear movement, and passing each respective inlet and outlet unilateral valve, the measurement volume at two sides of the piston is quantitatively outputted and measured one time in a moving period of the piston.

[0015] The main advantages of this invention are: not only can conduct the quantitative output and measurement for all media passing through the feeding pump device of volume tube, but also can conduct the self-adaptive control for the medium flow of the customer pipeline system through the control measurement system of the feeding pump device of volume tube, making it own a good match with the

medium flow of the customer pipeline system; the functions of the active and passive feeding pump devices of volume tube are integrated, the range of the quantitative output and measurement of the medium flow is greatly widened, the measurement devices of the liquid medium flow can be detected in situ, and the functions of the traditional volume tube devices and the medium measurement feeding pump are combined and developed. The corrosion due to connection between the lead screw and the medium to be detected is avoided in that the structure of protecting the lead screw through its casing pipe connected with the piston is used, which is convenient to lubricating and cooling the lead screw. The dragging mechanism is relatively simple as compared with that of the traditional volume tube devices. And the medium flow is bigger comparing with that of the traditional measurement feeding pump devices.

[0016] In some embodiments, like what is shown in Figure 1 for the structure of feeding pump device of volume tube, servo motor 22 is rotated through belt gear 21 driving lead screw 23, lead screw 23 drags piston 9 conducting the reciprocating motion in volume tube measurement volume 11 by lead screw nut 25 and casing pipe 6 of lead screw, the detected medium from liquid inlet pipe 12 passes liquid inlet unilateral valve 8 into volume tube measurement volume 11, the detected medium passes liquid outlet unilateral valve 7 and falls from volume tube measurement volume 11 into liquid outlet pipe 10, and then the output quantity of the medium can be calculated after precisely measuring the piston position by using grating ruler 4. This device uses a structure design that the piston in the volume tube is driven by a ball screw dragged by the motor and that the rotation motion of the motor is turned into the reciprocating rectilinear motion using the ball screw.

[0017] A limit micro-switch can be set at the end to ensure the precise reciprocating measurement at each time. Each measurement result is imputed to the computer to conduct the precise statistic and calculation, so as to ensure the measuring accuracy of flow and volume.

[0018] In the other embodiments, like what is shown in Figure 2 for the structure of the measurement feeding pump device of volume tube, linear motor 2 drives piston 9 conducting the reciprocating motion in volume tube measurement volume 11, the detected medium falls into volume tube measurement volume 11 from liquid inlet pipe 12 and liquid inlet unilateral valve 8, the detected medium bleeds off volume tube measurement volume 11 through liquid outlet unilateral valve 7 and falls into liquid outlet pipe 10, and then calculate the medium output quantity after conducting the precise measurement for the piston position using grating ruler 4.

[0019] The operation mode of volume tube measurement pump device is both-way quantitative output liquid, i.e., when the piston moves towards volume A, the liquid in volume A passes through the unilateral liquid outlet valve and quantitatively bleeds off the liquid to the cylinder outside, at the same time, volume B passes through the unilateral liquid inlet valve and quantitatively feeds the liquid from the cylinder outside; when the piston moves towards volume B, the liquid in volume B passes through the unilateral liquid outlet valve and quantitatively bleeds off the liquid to the cylinder outside, at the same time, volume A passes through the unilateral liquid inlet valve and quantitatively feeds the liquid from the cylinder outside;

in this way, the function of both-way quantitative output liquid can be realized by means of the reciprocating motion of the piston.

[0020] The switch time sequence of ingress and egress of the unilateral valve of the feeding pump device of volume tube is: when the piston moves towards volume B and reaches the dead point, turn off the unilateral liquid inlet valve of side B after an interval of t_x, and simultaneously turn off the unilateral liquid inlet valve of side A; after an interval of t_y, turn on the unilateral liquid inlet valve of side B, and simultaneously turn on the unilateral liquid inlet valve of side A; after an interval of t_z, the piston moves towards volume A through counter revolution of the lead screw, when the piston reaches the dead point, turn off the unilateral liquid inlet valve of side B after an interval of t_z, and simultaneously turn off the unilateral liquid inlet valve of side A; after an interval of t_y, turn on the unilateral liquid inlet valve of side B, and simultaneously turn on the unilateral liquid inlet valve of side A; so the piston and the inlet and outlet liquid unilateral valve conduct such reciprocating cycle motion. The time interval from the piston stop to the next movement is t second, and $t=t_x+t_y+t_z$. The time sequence relation among the lead screw, the piston and the unilateral liquid inlet and outlet valves are shown in Figure 3.